DOCUMENT RESUME

ED 223 970 CS 006 880

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TITLE Relationships between Kindergarten Children's Performance on Selected Piagetian Tasks, Berko's Test of Morphology, and Free Word Associations.
PUB DATE Feb 82
NOTE 28p.; Paper presented at the Annual Meeting of the Eastern Educational Research Association (West Palm Beach, FL, February 10-13, 1982).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Associative Learning; *Child Development; Cognitive Development; Grammar; *Kindergarten Children; *Language Acquisition; Linguistic Performance; *Morphology (Languages); Primary Education; Psycholinguistics; *Reading Research; Visual Discrimination
IDENTIFIERS Berko Test of Morphology; *Piagetian Theory

ABSTRACT

The research literature suggests that the processes involved in language and cognitive development are similar in nature, especially during the early years. Both require some method for assimilation and accommodation of incoming stimuli, both appear to be continuous and hierarchical in nature, and both require the development and refinement of a rather complex system for storage, retrieval, and future usage. Therefore, a study was conducted to examine the relationships found among kindergarten children's performance on selected Piagetian tasks of seriation, classification, and conservation; application of rules of grammar as measured by "Berko's Test of Morphology"; and types of responses to a free word association task. Subjects included 15 kindergarten boys and 15 kindergarten girls. Each subject was administered all of the tasks over a 2-week period. Since memory was not being tested, questions and words were repeated as the child required. Results of the morphology test were assigned scores according to percentages of correct responses. Responses to the selected Piagetian tasks were scored categorically as correct or not. The free word association tasks were scored categorically according to the number of paradigmatic responses above or below the median. Results indicate a significant positive relationship between the subjects' performance on the Piagetian tasks and the test of morphology. A significant positive relationship was also found between subjects' performance on the Piagetian tasks and their paradigmatic or higher order responses on the free word association tasks. (HOD)

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ED223970

RELATIONSHIPS BETWEEN KINDERGARTEN CHILDREN'S PERFORMANCE ON SELECTED PIAGETIAN TASKS, BERKO'S TEST OF MORPHOLOGY, AND FREE WORD ASSOCIATIONS

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Format Preference: D--Traditional didactic

Paper presented at the Annual Conference of the Eastern Educational Research Association, West Palm Beach, Florida, February 10-13, 1982.

CS206880

Purpose of this study:

The major objective of this study is to examine the relationships between kindergarten children's performance on selected Piagetian tasks of seriation, classification, and conservation; application of their rules for grammar as measured by Berko's Test of Morphology; and responses to free word associations. The focus of the study is to examine the relationships between language and thought processes.

Perspectives:

Young children grow and develop as holistic individuals. Each area of development - social, emotional, physical, and intellectual - is interrelated with all others. Examples of this interrelatedness can be observed as young children grow and acquire physical independence while simultaneously undergoing the process of decentration or the ability of viewing their environment from a point of view other than their own. During this period, they engage in a variety of social interactions which require sharing, taking turns, and participating in beginning forms of true cooperative play. While engaging in these experiences, their egocentric langauge becomes more socialized for communication of inner thoughts and ideas to others.

Many theories of language acquisition and development are based on an interrelationship between language and thought processes. This relationship is especially apparent during the formative early years. Both language and cognitive development appear to involve the processes described by Piaget as assimilation, whereby the child receives incoming stimuli and accepts it into his existing mental structures or scheme, and accommodation, which requires a modification or change in his existing scheme to fit the incoming stimuli (Biehler, 1981). Examples of these two important processes can be observed as the normal young child acquires and develops his native language. He begins to produce single word utterances to identify specific stimuli such as naming his small furry pet dog a "goggie". At some later point in time, he generalizes and applies this single word utterance, "goggie", to other small furry animals such as cats or rabbits. Later on, he differentiates between the small furry pet dog and other small furry animals. At this time, he apparently modifies his "dog" scheme and forms new schemes for "cat" or "rabbit" (Menyuk, 1971; Biehler, 1981).

Both language and cognitive development are continuous and hierarchical in nature. Piaget emphasized this continuity of development and believed that one specific scheme could appear in rudimentary form from one to two substages before its full establishment. He also believed that a scheme becomes further expanded upon and refined even after its establishment (Moerk, 1979). This belief is supported by the behavior of preoperational children who are inconsistent in their performance on the Piagetian tasks of seriation, classification, and conservation. They appear to use a trial and error strategy for completing the tasks and are often referred to as being in a transitional phase of cognitive development. However, at some time near the end of the preoperational stage or at the beginning of concrete operations, they become consistently successful in completion of these tasks. The same phenomena

occurs in the language production of children from about five to seven years of age, the age range at which most children are functioning at the preoperational level of cognitive development. They can be observed applying their rules for grammar appropriately at times yet inappropriately at others. According to Menyuk (1971), these inconsistencies in grammar involve omissions, failure to observe restrictions of co-occurance, and the use of redundancies. Examples of this language behavior result in constructions such as, "She work", "I want a toys.", and "My mama she work." Later on they begin to apply their rules consistently even though their constructions may seem incorrect in comparison to adult language (Biehler, 1981). Such original constructions during this phase include words like "eated", "buyed", and "runned".

The development and refinement of a complex classification system for lexical items appear essential for storage, retrieval, and production of adult-like sentences. Children in the early childhood or preoperational period acquire and develop new lexical items at an extremely rapid pace, incorporating them into their language classification system and refining their meanings for future retrieval and usage. Word association studies suggest that these lexical items may have meanings separate from sentences (Menyuk, 1971). Responses to association tasks are categorized as 1) syntagmatic or responses that are not in the same syntacitic class as the stimulus word but are usually found following the stimulus word such as "jump - high" or 2) paradigmatic, responses in the same syntactic class as the stimulus word such as "jump - hop". According to Entwistle (1966), syntagmatic responses are more frequently given by children under the age of 8 years. Paradigmatic responses increase dramatically between the ages of 5 to 7 years and continue to increase steadily through college (Menyuk, 1971). Cazden (1972) states that in general, associations change with age along three dimensions:

> first, from associations based on sounds, such as stick-lick, to associations based on meanings, such as stick-wood; second, from syntagmatic associations between words that follow each other in a sentence, such as deep-hole, to paradigmatic associations between words that can replace each other, such as deep-shallow; third, from more idiosyncratic responses to greater commonalities among children. (p. 219)

During the preoperational period the child is also developing and refining an elaborate system of classification for storage, retrieval, and use of information. At first he is able to classify objects according to only one attribute such as color, size, or shape failing to observe the principles of class inclusion. Later on in this highly complex process, he classifies objects by more than one attribute and then according to superordinate principles (Ginsburg and Opper, 1979).

Summary:

The literature suggests that the processes involved in language and cognitive development are similar in nature, especially during the early years. Both require some method for assimilation and accomodation of incoming stimuli; both appear to be continuous and hierarchical in nature; and both require the development and refinement of a rather complex system for storage, retrieval, and future usage. Therefore, the following study was conducted to examine the relationships found among kindergarten children's performance on selected Piagetian tasks of seriation, classification, and conservation; application of rules for grammar as measured by Berko's Test of Morphology; and types of responses to a free word association task.

It was hypothesized that:

H_1 Kindergarten children who perform high on selected Piagetian tasks of seriation, classification, and conservation will also score above the median on Berko's Test of Morphology.

H_2 Kindergarten children who perform high on selected Piagetian tasks of seriation, classification, and conservation will also score above the median on the number of paradigmatic responses on the Free Word Associations Task.

H_3 Kindergarten children who score above the median on Berko's Test of Morphology will also score above the median on the number of paradigmatic responses on the Free Word Associations Task.

To further examine relationships between the processes involved in the development of language and cognition, the following subhypotheses were formulated.

1. Subjects who successfully complete the Piagetian seriation task will also score above the median on Berko's Test of Morphology.
2. Subjects who score high on the Piagetian tasks of classification will also score above the median on Berko's Test of Morphology.
3. Subjects who score high on the Piagetian tasks of conservation will also score high on Berko's Test of Morphology.
4. Subjects who successfully complete the Piagetian task of seriation will also score above the median on the number of paradigmatic responses on the Free Word Associations Task.
5. Subjects who score high on the Piagetian tasks of classification will also score above the median on the number of paradigmatic responses on the Free Word Associations Task.
6. Subjects who score high on the Piagetian tasks of conservation will also score above the median on the number of paradigmatic responses on the Free Word Associations Task.

Methods and Techniques:

Subjects were 30 white kindergarten children, 15 boys and 15 girls. The children were from lower-middle and lower income homes with a large group bussed from a low income housing development in central West Virginia. The age range was from five-years-seven-months to six-years-eight-months. Children attended either morning or afternoon sessions of a public school kindergarten.

Materials: Each child was individually administered all of the tasks in the following order:

1. Berko's Test of Morphology consisting of 27 plates or cards with brightly colored pictures representing nonsense and actual English words (Berko, 1958). The test was designed to determine whether the child had internalized morphological rules for his language and was able to apply these rules to new situations. Among the areas included in the test are past tense, plurals, and possessives.
2. Piagetian tasks: classification by size, color and shape (big and little circles and squares, red and blue colors); seriation (10 blocks of increasing size); conservation of number (10 straws and 10 glasses), length (2 equal lengths of yarn), mass (2 equal balls of clay), volume (1 quart pitcher, 4 half-pint beakers, 1 large flat pie plate); and
3. Free Word Associations Task - a 25 item list that includes nouns, adjectives, pronouns, adverbs, verbs, and prepositions taken from reading preprimers (see Appendix A).

Data Source

Each subject was administered all of the above tasks over a two week period. Questions and words were repeated as the child required since memory was not being tested. Results of Berko's Test of Morphology were assigned scores according to percentages of correct responses. A simple frequency distribution (Table 1) shows a median of 77 and a mean of 76.26. Responses were scored

categorically to indicate above or below the median. The Free Word Associations Task was also scored categorically according to the number of paradigmatic responses above or below the median (Table 2).

Insert Tables 1 and 2 about here

Responses to the selected Piagetian tasks were scored categorically as correct or not. To test the three main hypotheses, eight selected tasks including one seriation, three classification, and four conservation tasks were administered. Subjects who successfully completed five of the eight tasks were assigned to the high category while those with four or fewer correct were assigned to the low category. To further examine any relationship between processes of language and cognitive development and to test the subhypotheses, types of Piagetian tasks were examined separately. The seriation task was scored categorically as correct or not. Results of the classification tasks were assigned categorically to high, indicating correct responses to two or more of the three tasks, or low, indicating a correct response to only one or none of the tasks. Conservation tasks were also scored categorically as high to indicate correct responses to three or more of the four tasks or low to indicate correct responses to two or fewer of the tasks.

Results:

To test the first hypothesis, that kindergarten children who perform high on selected Piagetian tasks of seriation, classification, and conservation will also score above the median on Berko's Test of Morphology, a Chi Square was computed. A significant positive relationship was found approaching the $< .01$ level (Table 3). Both the observed frequencies of students who performed high on the Piagetian tasks and above the median on Berko's Test, and those of students who scored low on the Piagetian tasks and below the median on Berko's Test were greater than the frequencies expected by chance alone. Further

TABLE 1

Simple Frequency Distribution of Berko's Scores

Score	f	Score	f
96	2	72	0
95	0	71	0
94	0	70	1
93	0	69	0
92	4	68	0
91	0	67	0
90	0	66	2
89	0	65	0
88	2	64	0
87	0	63	0
86	0	62	2
85	2	61	0
84	0	60	0
83	0	59	1
82	0	58	0
81	4	57	0
80	0	56	0
79	0	55	2
78	0	54	0
77	2	53	0
76	0	52	0
75	0	51	2
74	4	50	0
73	0		

N = 30

Mean = 76.26

Median = 77

TABLE 2

Simple Frequency Distribution of Paradigmatic Responses on Free Word Associations Task

Score	f
20	1
19	4
18	3
17	2
16	3
15	2
14	4
13	4
12	0
11	4
10	1
9	0
8	1
7	0
6	1

N = 30

Mean = 14.6

Meadian = 14.5

examination of the data reveals that over 75% of the students are accounted for in these two categories while the observed frequencies of students who performed high on the Piagetian tasks and below the median on Berko's Test and those of students who performed low on Piagetian tasks and above the median on Berko's Test are both below the expected frequencies for these two categories and account for less than one-fourth of all the students. This suggests a strong positive relationship between kindergarten students' performance on these Piagetian tasks and on tasks which require application of their rules for grammar as measured by Berko's Test of Morphology.

Insert Table 3 about here

A signitificant positive relationship was found (Table 4) between subjects' performance on the selected Piagetian tasks of seriation, classification, and conservation and on the Free Word Associations Task which approaches the $< .01$ level. The observed frequencies of students who performed high on Piagetian tasks and above the median in paradigmatic responses on the Free Word Association Task as well as the observed frequencies of students who performed low on the Piagetian tasks and below the median on the Word Associations Task are greater than frequencies expected by mere chance alone. In addition, the observed frequencies in these two categories account for over 75% of all students while observed frequencies of students who performed low on Piagetian tasks and above the median on the Free Word Associations task and those of students who performed high on Piagetian Tasks and below the median on the Free Word Associations Task account for less than 25% of the students. This suggests a significant positive relationship between kindergarten students' performance on these Piagetian tasks and paradigmatic or higher order responses to free word associations.

TABLE 3

Students' Performance on Berko's Test of Morphology and Selected Piagetian Tasks (Seriation, Classification, and Conservation)

Selected Piagetian Tasks		Berko's Test of Morphology: Above Median	Below Median	Totals
	High	A 12(8)	B 3(7)	15
	Low	C 4(8)	D 11(7)	15
	Totals	16	14	N = 30

$$X^2 = \frac{N([AD - BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([132 - 12] - 15)^2}{(16)(14)(15)(15)}$$

$$= \frac{330750}{50400} = 6.56$$

$X^2_{.01}$, df = 1, is 6.64
or $X^2_{.05}$, df = 1, is 3.84

Significant, $p < .05$

TABLE 4

Students' Performance on Selected Piagetian Tasks (Seriation, Classification, and Conservation) and Free Word Associations Task

		Free Word Associations Task Paradigmatic Responses		
		Above Median	Below Median	Totals
Selected Piagetian Tasks	High	A 12(8)	B 3(7)	15
	Low	C 4(8)	D 11(7)	15
Totals		16	14	N = 30

$$X^2 = \frac{N([AD - BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([132-12] - 15)^2}{(15)(15)(16)(14)}$$

$$= \frac{330750}{50400} = 6.56$$

$X^2_{.01}$, df = 1, is 6.64
$X^2_{.05}$, df = 1, is 3.84
Significant, $p < .05$

Insert Table 4 about here

Findings of this study (Table 5) do not show significant relationships between kindergarten children's performance on Berko's Test of Morphology and on the paradigmatic responses on the Free Word Associations Task. This supports Menyuk's (1971) belief that lexical items presented on word associations studies may have meanings separate from sentences. It also suggests that these two tasks may be measuring different language and thought processes.

Insert Table 5 about here

Examination of the results of students' performance on the three different types of Piagetian tasks - seriation, classification, and conservation - and Berko's Test of Morphology (Tables 6, 7, and 8) shows that the observed frequencies of students performing high on Piagetian tasks and above the median on Berko's Test and the observed frequencies of students scoring low on the Piagetian task and below the median on Berko's Test are greater than frequencies expected by mere chance. Relationships between the observed frequencies on both classification and conservation tasks and Berko's Test approach significance at the $< .05$ level. This suggests the need for further study to include more subjects.

Insert Tables 6, 7, and 8 about here

Observed frequencies of students' performance (Table 9) above the median on paradigmatic responses on the Free Word Associations task and in the yes category on the Piagetian seriation task and the observed frequencies of students' performance below the median on the Word Associations Task and in

TABLE 5

Students' Performance on Berko's Test of Morphology
and Free Word Associations Task

		Berko's Test of Morphology: Above Median	Berko's Test of Morphology: Below Median	Totals
Free Word Associations Task: Paradigmatic Responses	High	A 10(8)	B 5(7)	15
	Low	C 6(8)	D 9(7)	15
Totals		16	14	N = 30

$$X^2 = \frac{N([AD - BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([90 - 30] - 15)^2}{(15)(15)(16)(14)}$$

$$= \frac{60750}{50400} = 1.205$$

$X^2.05$, df = 1, is 3.84
Not significant, $p < .05$

TABLE 6

Students' Performance on Berko's Test of Morphology and a Piagetian Seriation Task

		Berko's Test of Morphology: Above Median	Berko's Test of Morphology: Below Median	Totals
Piagetian Seriation Task	Yes	A 11(9.0)	B 6(8)	17
	No	C 5(7)	D 8(6)	13
Totals		16	14	N = 30

$$X^2 = \frac{N([AD - BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([88-30] - 15)^2}{(17)(13)(16)(14)}$$

$$= \frac{55470}{49504} = 1.12$$

$X^2.05$, df = 1, is 3.84
Not significant, $p > .05$

TABLE 7

Students' Performance on Berko's Test of Morphology and Piagetian Classification Tasks (Color, Size, Shape)

		Berko's Test of Morphology: Above Median	Berko's Test of Morphology: Below Median	Totals
Piagetian Classification Tasks	High	A 11(8)	B 4(7)	15
	Low	C 5(8)	D 10(7)	15
Totals		16	14	N = 30

$$X^2 = \frac{N([AD-BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([110-20] - 15)^2}{(15)(15)(16)(14)}$$

$$= \frac{168750}{50400} = 3.34$$

$X^2.05$, df = 1, is 3.84
Not significant, $p < .05$

TABLE 8

Student's Performance on Berko's Test of Morphology
and Four Piagetian Conservation Tasks

		Berko's Test of Morphology: Above Median	Berko's Test of Morphology: Below Median	Totals
Piagetian Conservation Tasks	High	A 10(7)	B 3(6)	13
	Low	C 6(9)	D 11(8)	17
	Totals	16	14	N = 30

$$X^2 = \frac{N([AD-BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([110-18] - 15)^2}{(13)(17)(16)(14)}$$

$$= \frac{177870}{49504} = 3.5930$$

X^2 .05, df = 1, is 3.85
Not significant, $p < .05$

the no category on the seriation task are greater than that which could be expected by chance alone and account for over two-thirds of all students. This suggests the need for further study with a larger population of kindergarten students.

Insert Table 9 about here

This study shows a significant positive relationship (Table 10) between students performance on the Piagetian classification tasks and paradigmatic responses on the Free Word Associations Task at the $< .01$ level. The observed frequencies of students who performed above the median on the word associations and high on the classification tasks and those of students who performed below the median on the word associations and low on classification tasks are greater than the frequencies expected by mere chance alone. Furthermore, these two categories account for over 75% of all subjects. This suggests that these two processes are closely related indicating that students who perform high on the Piagetian classification tasks might also be expected to score above the median in the number of higher order or paradigmatic responses on free word associations tasks.

Insert Table 10 about here

Examination of students' performance (Table 11) on Piagetian conservation tasks and the Free Word Associations Task shows that although there is no significant relationship indicated, the observed frequencies of students scoring above the median on the Free Word Association task and high on the conservation tasks and those of students who performed below the median on the word associations and low on conservation tasks were greater than that expected by mere chance. Thus, these results indicate the need for further

TABLE 9

Students' Performance on a Piagetian Seriation Task and Paradigmatic Responses on the Free Word Associations Task

		Free Word Associations Task: Paradigmatic Responses		
		Above Median	Below Median	Totals
Piagetian Seriation Task	Yes	A 11(8.5)	B 6(8.5)	17
	No	C 4(6.5)	D 9(6.5)	13
	Totals	15	15	N = 30

$$X^2 = \frac{N([AD - BC[- N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([99 - 24] - 15)^2}{(17)(13)(15)(15)}$$

$$= \frac{108000}{49725} = 2.17$$

X^2 .05, df = 1, is 3.84
Not significant, $p < .05$

TABLE 10

Students' Performance on Piagetian Classification Tasks and Paradigmatic Responses on the Free Word Associations Task

		Free Word Associations Task: Paradigmatic Response		
		Above Median	Below Median	Totals
Piagetian Classification Tasks	High	A 12(8)	B 4(8)	16
	Low	C 3(7)	D 11(7)	14
	Totals	15	15	N = 30

$$X^2 = \frac{N([AD-BC] - n/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([132 - 12] - 15)^2}{(16)(14)(15)(15)}$$

$$= \frac{330750}{47040} = 7.03$$

$X^2.01$, df = 1, is 6.64
Significant, $p < .01$

study with a larger population of kindergarten students to closely examine these relationships. In addition, since conservation tasks are believed to require a higher level of cognitive functioning than the selected Piagetian seriation and classification tasks included in this study, it suggests the need to duplicate this study with students including a broader age range, perhaps from ages four through seven years.

Insert Table 11 About Here

Conclusions and Implications

Findings of this study support the belief that there is a strong positive relationship between the young child's development of language and thought processes. A significant positive relationship was found between kindergarten students' performance on selected Piagetian tasks of seriation, classification, and conservation and on Berko's Test of Morphology, a test which requires the child to apply his internalized rules for grammar to new sentence situations. This implies that children who are successful in completion of these Piagetian tasks may also be expected to be successful in tasks which require them to apply their internalized rules for grammar to new and different contextual situations. It further suggests that as the child assimilates aspects of his native language, he also makes necessary adjustments, or accommodates his internalized scheme for language to make his rules fit new and different situations.

A significant positive relationship was also found between kindergarten students' performance on selected Piagetian tasks of seriation, classification, and conservation and on paradigmatic, or higher order responses, on the Free Word Associations Task. The observed frequencies of students who performed high on the Piagetian tasks and above the median on the word associations task and of those who performed low on Piagetian tasks and below the median on the

TABLE 11

Students' Performance on Piagetian Conservation Tasks and Paradigmatic Responses on the Free Word Associations Task

		Free Word Associations Task: Paradigmatic Responses		
		Above Median	Below Median	Totals
Piagetian Conservation Tasks	High	A 8(6.5)	B 5(6.5)	13
	Low	C 7(8.5)	D 10(8.5)	17
	Total	15	15	N = 3

$$X^2 = \frac{N([AD - BC] - N/2)^2}{(A+B)(C+D)(A+C)(B+D)} = \frac{30([80 - 35] - 15)^2}{(13)(17)(15)(15)}$$

$$= \frac{27000}{49725} = .54$$

$X^2.05$, df = 1, is 3.84
Not significant, $p < .05$

word associations task were greater than frequencies expected by mere chance alone. Furthermore, these two categories accounted for 75% of all students. This finding implies that kindergarten students' performance on these Piagetian tasks might be predicted by their performance on the Free Word Associations Task.

Further examination of the findings of this study shows a significant positive relationship between kindergarten students' performance on Piagetian classification tasks and on paradigmatic responses on the Free Word Associations Task. This finding suggests that both language and thought process involve the development and refinement of highly complex systems for storage, retrieval, and future usage of information and/or language. It implies that for the normal child, these developmental processes may be highly interrelated, with the development and refinement of both language and thought processes further enhancing the potential for the continuous and hierarchical development of the other.

Although findings of this study did not indicate a significant positive relationship between kindergarten students' performance on Berko's Test of Morphology and the Free Word Associations Task, the observed frequencies of students who performed above the median on Berko's Test and above the median on the word associations task and those of students who performed below the median on Berko's Test and below the median on the word associations task were greater than frequencies expected by chance alone. It may be that these two tasks measure different processes, at least for kindergarten students. This supports the belief (Menyuk, 1971) that lexical items presented on free word association studies may have meanings separate from sentences.

Results of this study indicate the need for further study with a larger population to include children from the four through seven age range. To examine more fully the relationships between young children's performance on

Piagetian cognitive tasks and langauge related measures, researchers may also wish to examine the subcategories of words in Berko's Test (e.g., past tense, plurals, and passives) and types of words on the Free Word Associations Task (e.g., nouns, verbs, adjectives, and adverbs).

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APPENDIX A

FREE WORD ASSOCIATIONS TASK

1. house _____
2. run _____
3. they _____
4. in _____
5. father _____
6. there _____
7. fast _____
8. little _____
9. it _____
10. dog _____
11. want _____
12. she _____
13. has _____
14. jump _____
15. my _____
16. on _____
17. is _____
18. where _____
19. he _____
20. mother _____
21. big _____
22. under _____
23. red _____
24. see _____
25. book _____